

Article

The influence of barefoot, barefoot inspired and conventional shoes on tibial accelerations and loading kinetics during running at different velocities

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and kicking limbs. Intra-class correlations were used to relate sagittal and coronal/transverse plane waveforms in order to identify evidence of planar cross-talk.

The results indicate that in the transverse and coronal planes, the *YXZ* and *ZXY* sequences significantly influenced the peak angle and range of motion values. Utilisation of *YXZ* and *ZXY* sequences were associated with the strongest relationships with the sagittal plane for the hip, knee and ankle, while the *XYZ* sequence was found to be associated with the lowest relationships.

The findings suggest that altering the sequence of rotations does not affect the resultant kinematic parameters in the sagittal plane. However, the coronal and transverse plane parameters were shown to be significantly influenced, when using the *YXZ* and *ZXY* sequences. Observation of the knee joint kinematic profiles of the kicking limb in both the coronal and transverse also suggested that Gimbal lock is present in the *YXZ* and *ZXY* sequences. Finally, the intra-class correlation analysis supports the discrete variable analysis in that the *YXZ* and *ZXY* sequences were associated with the greatest extent of planar cross-talk while the *XYZ* sequence was associated with the lowest. It appears therefore that for the quantification of 3-D lower extremity kinematics during maximal out of hand kicking, the *XYZ* sequence is most appropriate.

No title

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Although the influence of barefoot and barefoot-inspired footwear on the kinetics of running has been examined previously in relation to conventional footwear, there is currently a paucity of research examining the efficacy of footwear, particularly barefoot and barefoot-inspired models at different velocities. Therefore the aim of the current investigation was to examine the influence on barefoot, conventional and barefoot-inspired footwear at three different velocities.

Ten male runners age 20.42 ± 3.55 years, height 178.75 ± 5.81 cm and body mass 76.58 ± 6.52 kg volunteered to take part in this study. Participants ran at 1.25, 3.5 and $5.0 \text{ m} \cdot \text{s}^{-1}$ in three different footwear barefoot, vibram five fingers (barefoot inspired) and saucony pro grid guide (conventional) over an embedded in the floor force plate operating at 1000 Hz (Kistler, Kistler Instruments Ltd., Alton,

Hampshire, UK) in a 22 m biomechanics laboratory. A tri-axial (Biometrics ACL 300, Gwent, UK) accelerometer sampling at 1000 Hz was utilised to measure axial accelerations at the tibia. The device was mounted on a piece of lightweight carbon-fibre material using the protocol outlined by Sinclair et al. (2010, 2013). Key parameters of impact peak, average loading rate, time to impact peak, instantaneous loading rate and peak tibial acceleration were extracted for statistical analysis. To examine the influence of footwear and velocity of each dependent measure, $3 \text{ (shoe)} \times 3 \text{ (velocity)}$ repeated measures ANOVA's were utilised with significance accepted at the $P \leq 0.05$ level. Significant interaction effects were further evaluated by performing simple main effect examinations on each level of the interaction with Tukey's planned comparisons.

The results show significant ($P \leq 0.05$) footwear and velocity main effects for average loading rate, time to impact peak, instantaneous loading rate and peak tibial acceleration. In addition, significant interactions were also observed for the average loading rate, time to impact peak, instantaneous loading rate and peak tibial accelerations. The follow-up analyses on these interactions suggest at each velocity condition (i.e. walk, jog and run) that the barefoot condition was associated with significantly greater impact parameters compared to the conventional and barefoot-inspired shoes. Similarly, the barefoot-inspired shoes were associated with greater impact kinetics compared to the conventional shoes. In addition, it was also found that at each footwear condition that impact parameters were significantly greater at the running velocity in comparison to both jogging and walking.

The observations from the current investigation suggest that barefoot running irrespective of locomotion velocity is associated with significantly greater impact kinetics compared to both barefoot inspired and conventional footwear. The results also show that running in barefoot and barefoot-inspired footwear at higher velocities may place runners at increased risk from injury.

The effect of caffeine ingestion on coincidence anticipation timing during 60-min submaximal cycling

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The impact of extended bouts of exercise on an individual's ability to execute cognitive tasks has long been of interest to sport scientists and researchers interested